IT Security for Transportation

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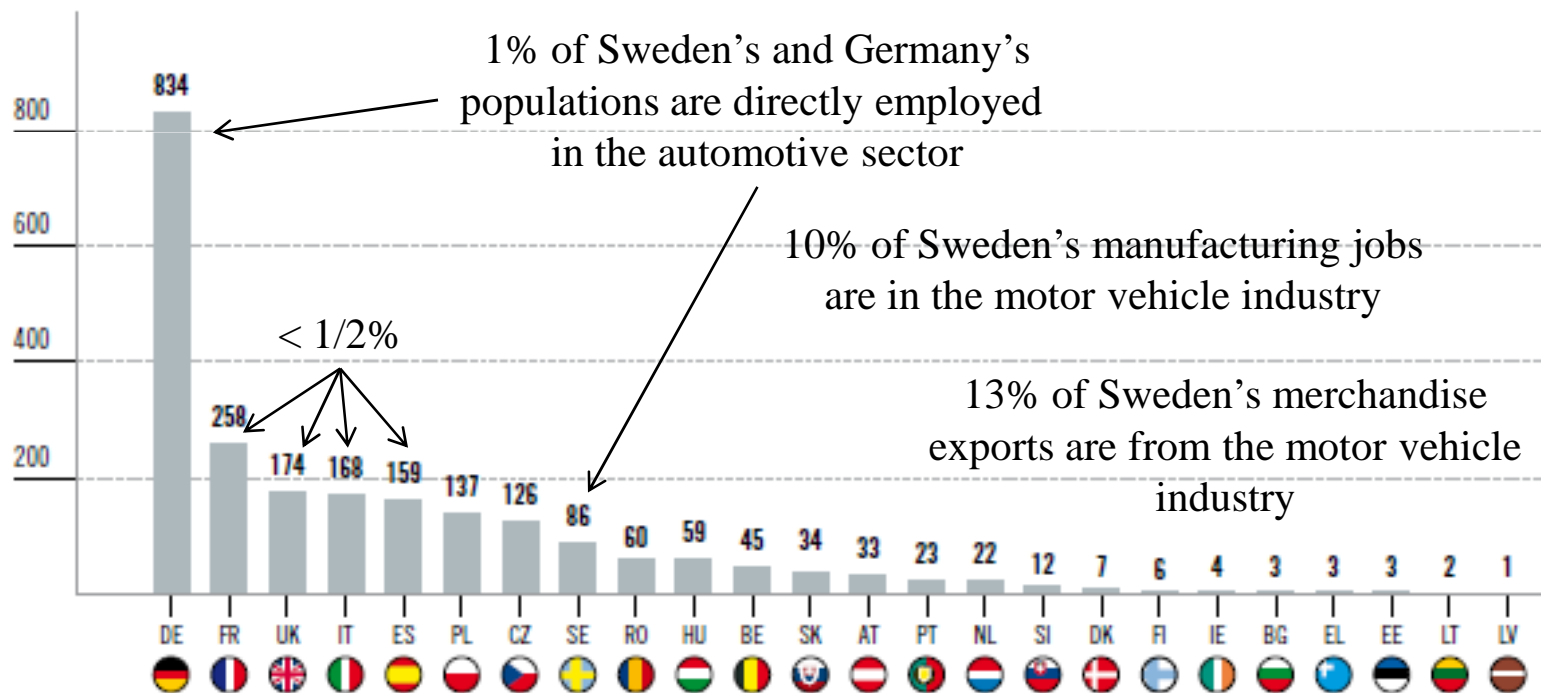
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Premise

❖ IT Security for Transportation is a subject of growing significance.

❖ It is an important area of research and development for all companies working in the transportation sector.

❖ It is a worthy topic of focus for applied research by academic institutions.

❖ The concept of the Knowledge Triangle, integrating education, research and innovation, is perfectly suited to this subject.

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Context

Employment in the automotive sector is as high per capita in Sweden as it is in Germany, and therefore just as important to the economy.

DIRECT AUTOMOTIVE EMPLOYMENT BY COUNTRY (in thousands) | 2007   SOURCE: Eurostat / ACEA
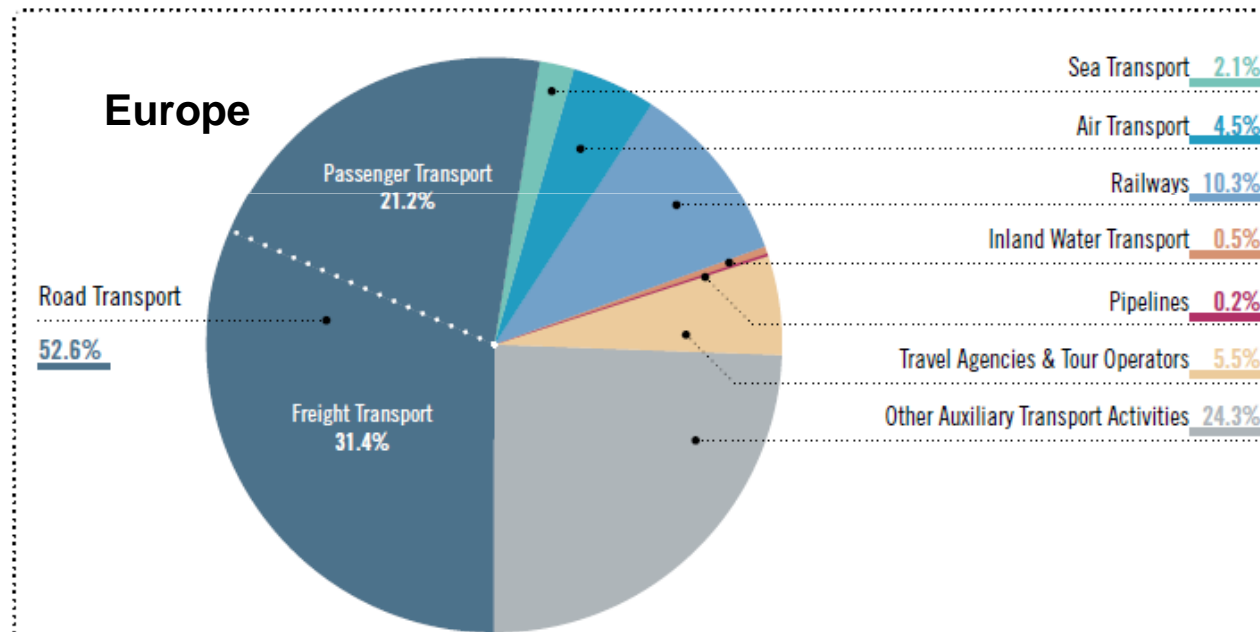
1% of Sweden's and Germany's populations are directly employed in the automotive sector

10% of Sweden's manufacturing jobs are in the motor vehicle industry

13% of Sweden's merchandise exports are from the motor vehicle industry

< 1/2%

| | 834 | 258 | 174 | 168 | 159 | 137 | 126 | 86 | 60 | 59 | 45 | 34 | 33 | 23 | 22 | 12 | 7 | 6 | 4 | 3 | 3 | 3 | 2 | 1 |
| DE | FR | UK | IT | ES | PL | CZ | SE | RO | HU | BE | SK | AT | PT | NL | SI | DK | FI | IE | BG | EL | EE | LT | LV |

Context

I will speak about road transport, not only because it is the most important transportation sector, but because it is the most vulnerable.

Employment* by Mode of Transport | 2007

Europe

Mode	%
Sea Transport	2.1%
Air Transport	4.5%
Railways	10.3%
Inland Water Transport	0.5%
Pipelines	0.2%
Travel Agencies & Tour Operators	5.5%
Other Auxiliary Transport Activities	24.3%

Passenger Transport 21.2%

Road Transport 52.6%

Freight Transport 31.4%

Based on EUROSTAT data, 2005

* Employment in companies whose main activity lies in the transport mode concerned
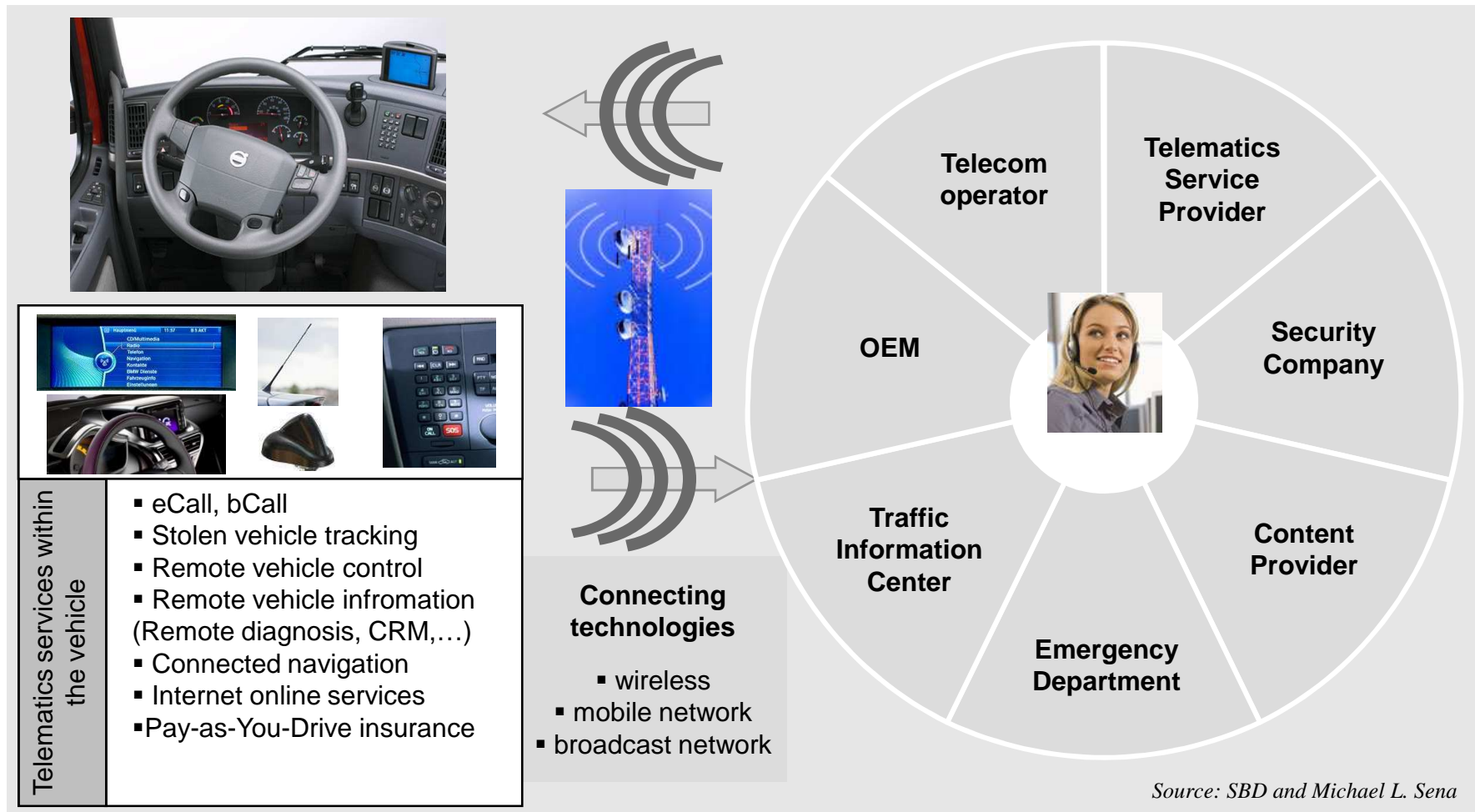
ACEA

Challenge

Road vehicles have gone from autonomous agents to communications nodes within the past fifteen years.

❖ Mobile communications and GPS merge into telematics in 1996: Ford, GM/OnStar, Motorola.

❖ Tele – Remote; Matic - Acting

❖ Volvo, BMW, Mercedes soon follow in Europe.

❖ Proprietary systems and protocols ensured that systems were secure from tampering and viruses.

❖ Lack of secure standards for communications inhibited fast growth.

In Car Computing

Safety Related Telematics

Monitoring of engine and brakes

Infotainment

Communications

Navigation

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Telamatics Today

Telematics services within the vehicle
- eCall, bCall
- Stolen vehicle tracking
- Remote vehicle control
- Remote vehicle infromation (Remote diagnosis, CRM,…)
- Connected navigation
- Internet online services
- Pay-as-You-Drive insurance

Connecting technologies
- wireless
- mobile network
- broadcast network

Telecom operator

Telematics Service Provider

OEM

Security Company

Traffic Information Center

Content Provider

Emergency Department

Source: SBD and Michael L. Sena

Challenge

The vehicles of tomorrow will require advanced communications capabilities in order to deliver improvements demanded by society.
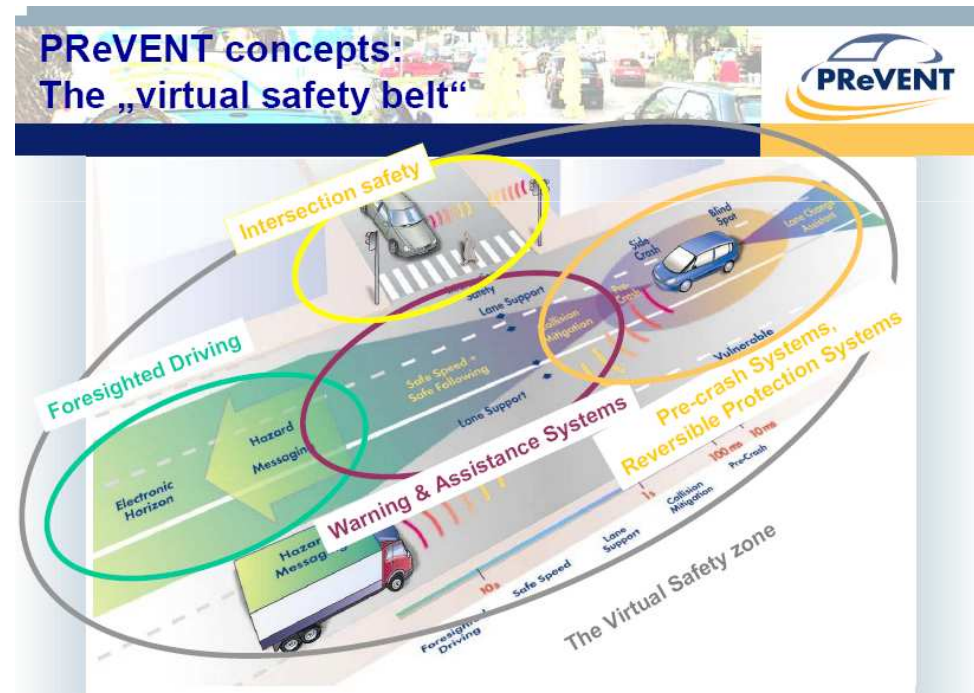
❖ **They will communicate with each other**
- Road surface problems
- Accident
- Slowdowns

❖ **They will pass information through the infrastructure**
- Travel speed
- Location (tolls, insurance, etc)

❖ **They will receive updates from the infrastructure**
- Temporary speed limits
- Roadworks
- Map data

PReVENT concepts: The „virtual safety belt"

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Challenge

Vehicle-to-Vehicle and Vehicle-to-Infrastructure communications must be secure if they are to be used safely

Possible abuses

❖ Thieves divert vehicles on road by sending false messages while hijacking a money transport truck.

❖ Terrorist agents increase speed limits on variable message signs and disengage stop signals causing major accidents.

❖ Criminal gangs steal information about individuals and their vehicles and subject owners to extortion.
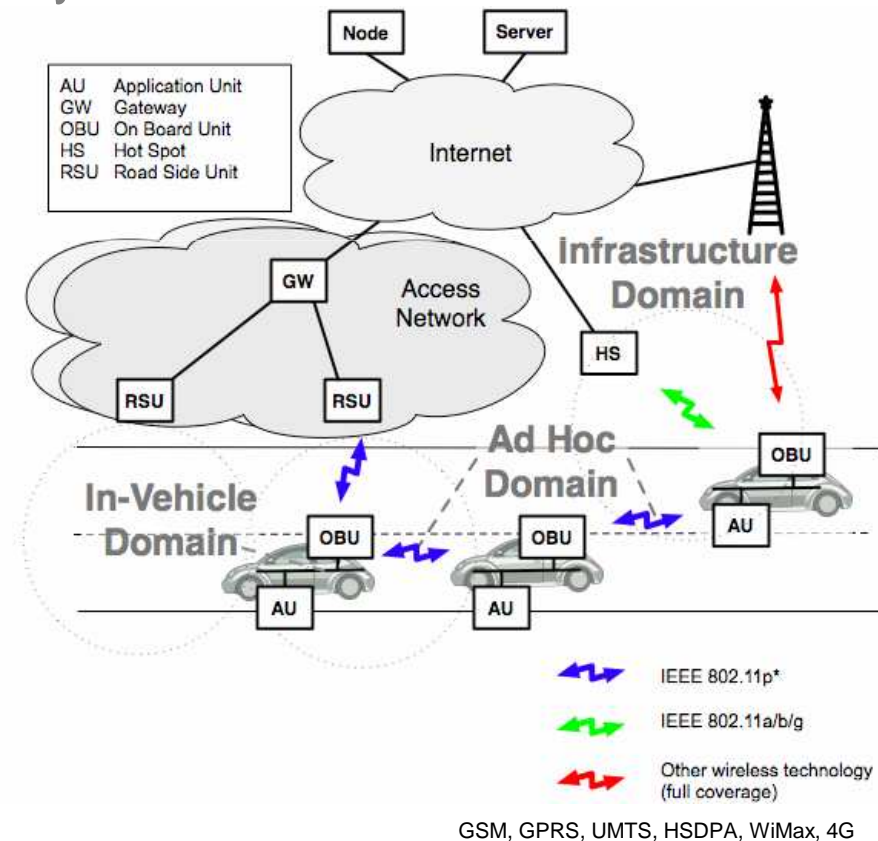
GSM, GPRS, UMTS, HSDPA, WiMax, 4G

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Opportunity

With applied research done in cooperation between universities and industry, we can address the important security questions

❖ Sweden is among the top five countries in the world in university/industry research collaboration.

❖ Chalmers is an important collaborator with the automotive industry in West Sweden.

❖ The Viktoria Institute is a centre of advanced research and innovation.

❖ Sweden in general and West Sweden in particular have become a focus for telematics companies.

❖ Telematics Valley is an important support organisation where industry, academia and government meet.

University/Industry research collaboration
It its R&D activity, business collaboration with local universities
(1=minimal or nonexistent; 7 = intensive and ongoing)

Rank	Country	Score
1	Switzerland	5.7
2	Sweden	5.5
3	Finland	5.5
4	United States	5.5
5	Germany	5.3
6	Israel	5.2
7	Taiwan	5.2
8	Singapore	5.2
9	Japan	5.2
10	United Kingdom	4.9

Source: *The Global Competitiveness Report 2007, Palgrave MacMillan, New York*

Example

Here is one example of a transportation application that has significant IT security content

Unmanned Aerial Vehicle (UAV)

❖ The unmanned aerial vehicle, ONERA, is a police helicopter weighing less than a kilo. It will be used in Liverpool, England to monitor antisocial behavior.

❖ The same technology could be used to monitor traffic in a region, sending video images of traffic flow to a central information centre for processing into speed data.

❖ Intercepting such images and using them for criminal purposes is a real threat.

The Microdrone MD4-200 is under a metre long and can be equipped with a 10-megapixel camera, digital video or low-light and infrared units. The device can also be fitted with a GPS unit and sent on pre-programmed flights without a human operator.

Obstacles

There are obstacles to integrating education, research and innovation in the transportation sector, including IT security

❖ **Economic pressures**

The vehicle manufacturing industry is very sensitive to financial downturns.

❖ **Competitive concerns**

Companies attempt to gain advantage through proprietary systems.

❖ **Political priorities**

Car producing countries try to protect their own industrial "home team" and the larger countries often win over the smaller.

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Relevant Measures

Government, private industry and research institutions need to work together to rebuild our "industrial commons".

❖ Applied research is not a product; it is a by-product of production.

❖ We need to understand that outsourcing eventually leads to the erosion and eventual disappearance of our industrial base, and without industry there is no research.

❖ Rather than selling out our industry, we need to encourage foreign investment and establishment of companies.

❖ We need to view cooperation as vital for our national survival.

The research lab for developing the bus of today from the bus of yesterday was the factory floor.

Conclusion

The line between activities performed inside and outside vehicles is being erased. Before it disappears, we need to make sure it is secure.

❖ IT Security for Transportation is a worthy topic of research and development for all companies working in the transportation sector and for our research institutions because transportation has wide-ranging effects on our societies.
❖ The concept of the Knowledge Triangle, integrating education, research and innovation, is perfectly suited to this subject because without dedicated research, we will not arrive at the necessary solutions.

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Thank you

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